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The Effect of Legal Drinking Age on Fatal Injuries of Adolescents and Young Adults

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ABSTRACT

This study examined the effect of legal drinking age (LDA) on fatal injuries in persons aged 15 to 24 years in the United States between 1979 and 1984. Effects on pre-LDA teens, adolescents targeted by LDA, initiation at LDA, and post-LDA drinking experience were assessed. A higher LDA was also associated with reduced death rates for motor vehicle drivers, pedestrians, unintentional injuries excluding motor vehicle injuries, and suicide. An initiation effect on homicides was identified. Reductions in injury deaths related to drinking experience were not found. In general, a higher LDA reduced deaths among adolescents and young adults for various categories of violent death. (*Am J Public Health.* 1992;82:112–115)

Introduction

While the effect of raising the legal drinking age (LDA) on reducing the involvement of young drivers in fatal motor vehicle crashes has been demonstrated,[1,2] the potential impact of this legislation on other alcohol-related violent deaths[3–16] has not been examined except in one state.[17] Therefore, this study investigates the relationship between LDA and all fatal injuries among adolescents and young adults.

The literature has suggested four possible effects of LDA:

1. *Legal Effect:* A high LDA reduces fatal injuries among adolescents targeted by the law.[2]
2. *Spillover Effect:* A low LDA increases fatal injuries among adolescents younger than the LDA through earlier access to alcohol from their older aged peers.[1,2]
3. *Initiation Effect:* An increase in fatal injuries in the year that access to alcohol becomes legal offsets the reductions of earlier years.[18,19]
4. *Experience Effect:* Reductions in fatal injuries occur as drinking experience increases. Fatal injuries decrease in the years following legal access.[18,19]

Methods

All 50 states and the District of Columbia were studied for the years 1979 through 1984. In each state and each year, LDA and injury death rates for persons 15 through 24 years of age were determined. Information on LDA was obtained from the Insurance Institute for Highway Safety (Table 1). Mortality data were col-

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lected from the National Center for Health Statistics. Injury deaths (E800–999) were identified, and six categories of death defined on the basis of the *International Classification of Diseases* (9th version; ICD-9) E-code were examined: motor vehicle driver, motorcyclist, pedestrian, unintentional injury excluding motor vehicle, suicide, and homicide (Table 2). The 1980 census provided population data to compute death rates. Census figures were adjusted by extrapolation to arrive at denominator data for the years 1979 and 1981 through 1984 (e.g., persons who were 18 in 1980 were considered 19 in 1981).

For each of the six categories of injury, the data were aggregated into death rates per 100 000 population by calendar year, age, and LDA, thus forming a matrix of 240 rates (6 calendar years × 10 single years of age × 4 LDAs). Calendar year was added to control for temporal trends in injuries. Logistic regression was used for analysis. The following model was fitted to the data:

$$\text{Rate} = a + b_1(\text{CALYR}) + b_2(\text{AGE}) + b_3(\textit{SPILLOVER}) + b_4(\textit{LEGAL}) + b_5(\textit{INITIATION}) + b_6(\textit{EXPERIENCE})$$

where Rate = fatal injury rate, CALYR = calendar year, AGE = age of the fatally injured person, SPILLOVER = LDA − age, if age < LDA (else 0), LEGAL = 1 if drinking legal at age of death or else 0, INITIATION = 1 if LDA = age or else 0, and EXPERIENCE = age − LDA + 1, if age > LDA (else 0). For the variables calendar year and age, a system of indicator variables was constructed to allow for expected nonlinearities in the death rate over time and age.

The following hypotheses were tested. If a low legal drinking age increases injuries in adolescents younger than the legal minimum—the "spillover effect"—injury rates will decrease as the years before legal access increase. If a high drinking age reduces injuries only among adolescents targeted by the legislation—the "legal effect"—a low drinking age will be associated with a high injury death rate among those who can drink legally. If an "initiation effect" occurs, fatal injuries will increase more than expected in the year that drinking becomes legal. If injuries decrease in the years following legalization—the "experience effect"—injury rates will decrease as experience with alcohol increases beyond the year that drinking becomes legal.

TABLE 1—Legal Drinking Age (LDA) Changes, United States, 1979–1984[a]

State	LDA	Date of Change	State	LDA	Date of Change
Ala	19		Mont	19	
Alaska[b]	19		Neb	19–20	7/19/80
Ariz[c]	19		Nev	21	
Ark	21		NH[j]	20	
Calif	21		NJ[j]	18–19	1/02/80
Colo[d]	21			19–21	1/01/83
Conn	18–19	7/01/82	NM	21	
	19–20	10/01/83	NY	18–19	12/04/82
Del[e]	20–21	1/01/84	NC[k]	18–19	10/01/83
DC	18		ND	21	
Fla	18–19	10/01/80	Ohio[d]	21	
Ga	18–19	9/01/80	Okla[d]	21	
Hawaii	18		Ore	21	
Idaho	19		Pa	21	
Ill[f]	19–21	1/01/80	RI	18–19	7/01/80
Ind	21			19–20	7/01/81
Iowa	19		SC[l]	18–19	1/01/84
Kan[d]	21		SD[d]	21	
Ky	21		Tenn[m]	19	
La	18		Tex	18–19	9/01/81
Me	20		Utah	21	
Md[g]	18–21	7/01/82	Vt	18	
Mass[h]	20		Va[n]	18–19	7/01/83
Mich	21		Wash	21	
Minn	19		WVa	18–19	7/01/83
Miss	21		Wis	18	
Mo	21		Wyo	19	

[a]Laws apply to all alcoholic beverages except where noted.
[b]10/26/83 from 19 to 21; grandfathered persons born on or before 12/31/64.
[c]12/31/84 from 19 to 21; grandfathered persons 19 before 12/31/84.
[d]18 (3.2% beer).
[e]Grandfathered persons 20 on 1/1/84.
[f]From 19 for beer and wine to 21 for all alcohol.
[g]From 18 for beer and light wine to 21 for all alcohol.
[h]4/16/79 from 18 to 20.
[i]5/24/79 from 18 to 20.
[j]1/2/80 from 18 to 19; grandfathered persons 18 before 1/2/80. 1/1/83 from 19 to 21; grandfathered persons 19 or 20 by 12/31/82.
[k]10/1/83 beer and unfortified wine law raised from 18 to 19.
[l]1/1/84 beer and wine law from 18 to 19.
[m]8/1/84 from 19 to 21; grandfathered persons born before 8/1/65.
[n]7/1/83 from 18 for "on-sale" and 19 for "off-sale" to 19 for all beer.

TABLE 2—Injury Death Rates and Deaths by Cause, for Persons Aged 15–24 Years, United States, 1979–1984

Cause of Death	ICD-9E Code	Death[a] Rate	No. of Deaths
Motor vehicle driver	E810–E819 (.0) E822–E824 (.0)	13.48	33 650
Motorcyclist	E810–E819 (.2, .3) E822–E824 (.2, .3)	4.38	10 923
Pedestrian	E810–E819 (.7) E822–E824 (.7)	3.57	8903
Unintentional[b] injuries excluding motor vehicle	E800–E807 E820–E821 E825–E949	15.24	38 034
Suicide	E950–E959	12.24	30 542
Homicide	E960–E978	13.84	34 526
All injuries[c]	E800–E999	82.55	206 002

Note. ICD-9 = *International Classification of Diseases*, 9th revision. (.0) = motor vehicle driver; (.1) = motor vehicle passenger; (.2) = motorcycle driver; (.3) = motorcycle passenger; (.7) = pedestrian; and (.9) = unknown.
[a]Number of deaths per 100 000 persons.
[b]Includes causes of injury death (e.g., drowning, house fire, fall).
[c]Includes the above categories of injury death as well as Motor Vehicle Occupants, E810–E819 (.1, .9) and E822–E824, (.1, .9) and Undetermined, E980–989.

TABLE 3—Estimated Effects of Legal Drinking Age on Injury Death Rates among Younger Adolescents (Spillover), Targeted Adolescents (Legal), Year of Majority (Initiation), and Young Adults (Experience), Aged 15–24, 1979–1984[a]

	Spillover		Legal		Initiaiton		Experience	
Cause of Death	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Motor vehicle driver	0.958*	(0.941,0.975)	1.062	(0.999,1.128)	1.009	(0.962,1.059)	1.051*	(1.037,1.065)
Motorcyclist	1.030	(0.997,1.063)	1.026	(0.921,1.141	1.080	(0.992,1.177)	0.989	(0.965,1.012)
Pedestrian	0.895*	(0.868,0.923)	0.933	(0.828,1.051)	1.013	(0.918,1.117)	1.124*	(1.094,1.154)
Unintentional injuries excluding motor vehicles	0.961*	(0.947,0.976)	0.982	(0.927,1.040)	0.947*	(0.903,0.994)	1.025*	(1.012,1.038)
Suicide	1.032*	(1.012,1.053)	1.097*	(1.028,1.171)	1.004	(0.953,1.057)	0.985*	(0.972,0.998)
Homicide	1.010	(0.991,1.029)	0.994	(0.935,1.056)	1.051*	(1.001,1.104)	1.070*	(1.057,1.083)
All injuries	0.993*	(0.986,0.999)	1.039*	(1.013,1.064)	1.010	(0.990,1.031)	1.021*	(1.016,1.027)

Note. OR = odds ratio; CI = confidence interval.
[a]Controlling for age and calendar year.
*$P < .05$.

Results

In Table 3 (first column), the coefficients are in the predicted direction (less than one) and significant for the following three categories: motor vehicle driver (odds ratio [OR] = 0.958), pedestrian (OR = 0.895), and unintentional injuries excluding motor vehicle (OR = 0.961). Yearly reductions in deaths of 4.2%, 10.5%, and 3.9%, respectively, are seen. While the coefficients are not in the predicted direction for three categories of fatal injury, only one, suicide, has a 95% confidence interval greater than one. For all injuries combined (OR = 0.993), a reduction in deaths of 0.7% is observed for each year that the legal drinking age is delayed.

In the second column, the coefficients are in the predicted direction (greater than one) for three categories of fatal injury: motor vehicle driver, motorcyclist, and suicide. However, only suicide (OR = 1.097) is significant. This coefficient suggests that among persons of a given age who can drink legally, the suicide rate is 9.7% greater than among persons of the same age who cannot drink legally, controlling for the other effects. For all injuries combined (OR = 1.039), a 3.9% increase in death rate is observed among persons of a given age who can drink legally.

In the third column, while the coefficients are in the predicted direction (greater than one) for five categories of fatal injury, only one, homicide (OR = 1.051), is significant. This coefficient suggests a 5% increase in homicides in the year that access to alcohol becomes legal. For unintentional injuries excluding motor vehicles (OR = 0.947), the coefficient indicates 5% fewer injuries than expected in the first year of legal drinking.

In the fourth column, the coefficients are opposite to the predicted direction (less than one) and significant for motor vehicle driver (OR = 1.051), pedestrian (OR = 1.124), unintentional injuries excluding motor vehicle (OR = 1.025), and homicide (OR = 1.070). The coefficient is in the predicted direction for suicide (OR = 0.985). For all injuries combined (OR = 1.021), a death-rate increase of 2.1% per year post-LDA was found.

Discussion

While the effect of LDA on fatal injuries varies among categories and age groups, the results of this study suggest that the net benefit of a drinking age of 21 is found not only among motor vehicle drivers, but among other categories of violent death as well. The findings indicate that raising the LDA may have three effects: delaying legal access to alcohol among pre-LDA adolescents, preventing traumatic deaths that occur with legal access, and delaying the onset of heavy drinking and associated fatal injuries that can occur with experience.

The results of this study are consistent with the findings of earlier research on LDA and driver fatalities in which alcohol was actually measured.[20] Furthermore, the LDA during the period studied was not related to the percentage of the population residing in metropolitan areas among the states, a potential confounding factor. However, the results would be more definitive if blood alcohol concentrations had been available for all categories of traumatic death. Universal measurement and reporting of blood alcohol in the fatally injured by age would enhance the evaluation of this and other alcohol countermeasures. □

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Evaluating the Treatment of Sexually Transmitted Diseases at an Urban Public Hospital Outpatient Clinic

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ABSTRACT

Sexually transmitted diseases occur disproportionately among the poor, are often treated in public hospitals and clinics, and have not been subjected to quality-of-care evaluation. We designed a medical record abstraction system using well-established, specific process-of-care criteria drawn from the medical literature and experts and grouped into three levels of quality: excellent, adequate, and minimal. One hundred seventy-six consecutive patients were identified from the clinic logbook and their medical records abstracted. Deficiencies in history taking, physical examination, laboratory testing, treatment, and public health reporting were identified. (*Am J Public Health.* 1992;82:115–117)

Introduction

Gonorrheal urethritis, nongonorrheal urethritis, and pelvic inflammatory disease are among the most commonly occurring sexually transmitted diseases. Appropriate treatment is curative, while lack of appropriate treatment can lead to serious implications. Sexually transmitted diseases occur disproportionately among the poor and underinsured,[1] who are more likely to receive care at a public hospital or a health department clinic. It is important to understand the quality of care delivered at these institutions. Therefore, we undertook an evaluation of the treatment of sexually transmitted diseases at one urban public hospital clinic.

Methods

The study hospital is a county-run facility in the Los Angeles metropolitan area that serves a poor, predominantly Hispanic population. The hospital's medical walk-in clinic sees adult patients with nonemergent problems and is staffed by full-time and part-time physicians and by medical residents. The nursing staff is bilingual. Physicians do not use disease-specific forms to record clinical information. Virtually all patients with sexually transmitted diseases presenting Monday through Friday are seen in this clinic.

We designed a medical record abstraction system to measure the quality of the process of care given to patients diagnosed with gonorrhea, nongonorrheal urethritis, and pelvic inflammatory disease. In order to develop explicit process-of-care criteria, we examined recommendations from the Centers for Disease Control, the Los Angeles County Public Health Department, and the scientific literature, and we also talked with experts. The final set of criteria was approved by the clinic director and the physician in charge of quality assurance for the treatment of sexually transmitted diseases. The criteria were grouped into three levels of quality: excellent, adequate, and minimal (Table 1).

Patients presenting to the clinic from November 1987 through February 1988 were eligible for the study. Patients who had a physician-recorded diagnosis that was compatible with one of the study diseases were included. One hundred seventy-six patients for whom the medical record was available were identified, and their medical records were abstracted. The physician-recorded history and physical, progress notes, physician orders, nursing notes, and laboratory reports were reviewed. Analytic methods included frequency tables and *t* tests.

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